1978 Operation Morning Light

NEST members from Livermore join the search for Cosmos 954, a fallen Soviet satellite. They found small pieces of the satellite and its nuclear reactor on frozen Baker Lake in the Northwest Territories of Canada.

When Satellites Go Bad

Cosmos 954 started losing orbital altitude in December 1977. The North American Aerospace Defense Command (NORAD) thought it would burn up in the Earth's atmosphere on reentry, but not much was known about the Soviet satellite—its size, its weight, and most important, the amount of nuclear material in its reactor. A month later, the Laboratory was quietly notified to get ready. NEST—the Nuclear Emergency Search Team—was prepared to find the satellite, wherever it landed.

After the first meeting at the Laboratory on January 18, 1978, two Livermore computer scientists were provided the exclusive use of a CDC-7600 computer, and they spent the next few sleepless days refining calculations of the trajectory and figuring out how wide an area—called the footprint—would result from the impact of variously sized pieces of Cosmos, including perhaps 100 pounds of nuclear fuel. The exact time and place of reentry would not be known until the final orbit.

Meanwhile, the Laboratory's NEST contingent—a group of health physicists, chemists, nuclear physicists, and engineers—left for the Las Vegas NEST office to wait. They had packed every type of clothing because they had no idea where they would ultimately end up. Radiation detectors, liquid nitrogen, sample containers, power generators, what passed for portable computers then, and even a helicopter were loaded into a C-141 aircraft—all to look for anything that survived reentry.

The final orbit happened on January 24. Cosmos fragments scattered across a 30-mile-wide, 500-mile-long swath of the Northwest Territories of Canada, a desolate area populated by caribou and a few Inuit hunters. Within 6 hours, the official request for help came from Canada, and Operation Morning Light began. The Canadians were depending on the Laboratory team to help find Cosmos pieces, identify the reactor fuel, and estimate the fission product inventory.

Soon, planes with radiation detectors were surveying the frozen landscape. The first radioactive pieces were found on January 26. Radioactivity ranged from a few milliroentgen to 100 roentgens per hour. No single piece was much larger than a small trash can, and tiny bits of radioactive fuel dotted the landscape. Hotspots were concentrated in a few places in the snow-packed forest and in the middle of frozen lakes. Because of the intense cold, team members could work only for short periods.

Operation Morning Light officially ended on April 18. At the peak of its operation—the first two weeks—120 U.S. personnel worked alongside the Canadians. Of that number, 39 were Laboratory people, with an additional 80 people back at Livermore supporting the team. Today, Laboratory personnel are still part of the Department of Energy's NEST team, ready to deploy at a moment's notice anywhere in the world.

Not Exactly California Weather

During Operation Morning Light, Livermore's Tom Crites was at the Baker Lake site, where the temperature hovered around –40˚F, or around –120˚F with the wind-chill factor. The Canadians had outfitted every team member with the latest survival gear. Tom needed it all. The hydraulically powered helicopter failed one day, requiring the team to build snow igloos and keep fires going. They endured a subzero night before a plane rescued them. A few people lost fingers and toes to frostbite. Tom has put his experience to good use leading Boy Scout camping trips in the Sierras. "Besides," he says, "where else can you look south to see the Northern Lights?"